

# Light Sensor

## (Order Code LS-BTA)

The Light Sensor can be used for measurements of light intensity in a variety of situations.



- Perform inverse square light intensity experiments using a point source of light.
- Conduct polarized filter studies.
- Demonstrate the flicker of fluorescent lamps and other lamps.
- Carry out solar energy studies.
- Perform reflectivity studies.
- Study light intensity in various parts of a house or school.
- Use it as part of a study of plant growth to measure light intensity.

## Collecting Data with the Light Sensor

This sensor can be used with the following interfaces to collect data:

- Vernier LabQuest® as a standalone device or with a computer
- Vernier LabQuest® Mini with a computer
- Vernier LabPro® with a computer, TI graphing calculator, or Palm® handheld
- Vernier Go!® Link
- Vernier EasyLink®
- Vernier SensorDAQ®
- CBL 2™

Here is the general procedure to follow when using the Light Sensor:

1. Connect the Light Sensor to the interface.
2. Start the data-collection software<sup>1</sup>.
3. The software will identify the Light Sensor and load a default data-collection setup. You are now ready to collect data.

## Data-Collection Software

This sensor can be used with an interface and the following data-collection software.

- **Logger Pro 3** This computer program is used with LabQuest, LabQuest Mini, LabPro, or Go!Link.
- **Logger Pro 2** This computer program is used with ULI or Serial Box Interface.
- **Logger Lite** This computer program is used with LabQuest, LabQuest Mini, LabPro, or Go!Link.
- **LabQuest App** This program is used when LabQuest is used as a standalone device.
- **EasyData App** This calculator application for the TI-83 Plus and TI-84 Plus can be used with CBL 2, LabPro, and Vernier EasyLink. We recommend version 2.0

or newer, which can be downloaded from the Vernier web site, [www.vernier.com/easy/easydata.html](http://www.vernier.com/easy/easydata.html), and then transferred to the calculator. See the Vernier web site, [www.vernier.com/calc/software/index.html](http://www.vernier.com/calc/software/index.html) for more information on the App and Program Transfer Guidebook.

- **DataMate program** Use DataMate with LabPro or CBL 2 and TI-73, TI-83, TI-84, TI-86, TI-89, and Voyage 200 calculators. See the LabPro and CBL 2 Guidebooks for instructions on transferring DataMate to the calculator.
- **Data Pro** This program is used with LabPro and a Palm handheld.
- **LabVIEW** National Instruments LabVIEW™ software is a graphical programming language sold by National Instruments. It is used with SensorDAQ and can be used with a number of other Vernier interfaces. See [www.vernier.com/labview](http://www.vernier.com/labview) for more information.

**NOTE:** This product is to be used for educational purposes only. It is not appropriate for industrial, medical, research, or commercial applications.

## Specifications

Resolution:

13-bit (with SensorDAQ)	12-bit (with LabQuest, LabQuest Mini, LabPro, Go! Link, EasyLink, ULI, or Serial Box Interface)	10-bit (with CBL 2):
0–600 lux: 0.1 lux		0–600 lux: 0.8 lux
0–6000 lux: 1 lux		0–6000 lux: 8 lux
0–150000 lux: 25 lux		0–150000 lux: 200 lux
	0–600 lux: 0.2 lux	
	0–6000 lux: 2 lux	
	0–150000 lux: 50 lux	

Stored Calibration Values for the Light Sensor

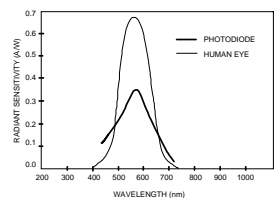
0–600 lux	slope = 154 lux/V intercept = 0 lux
0–6000 lux	slope = 1692 lux/V intercept = 0 lux
0–150000 lux	slope = 38424 lux/V intercept = 0 lux

This sensor is equipped with circuitry that supports auto-ID. When used with LabQuest, LabQuest Mini, LabPro, Go! Link, SensorDAQ, EasyLink, or CBL 2, the data-collection software identifies the sensor and uses pre-defined parameters to configure an experiment appropriate to the recognized sensor.

<sup>1</sup> If you are using Logger Pro 2 with either a ULI or SBI, the sensor will not auto-ID. Open an experiment file for the Light Sensor in the Probes & Sensors folder.

## How the Light Sensor Works

The sensor uses a Hamamatsu S1133 silicon photodiode. It produces a voltage which is proportional to light intensity. The spectral response approximates the response of the human eye as shown in this diagram. The switch on the box is used to select the range. If the reading from the sensor reaches the maximum for the selected ranges, you need to switch to a less sensitive range. If the reading is very small or 0, you need to select a more sensitive range.



*Spectral Response of the Hamamatsu S1133 Photodiode*

- The 0–600 lux range is the most sensitive range, and is useful for low levels of illumination.
- The 0–6000 lux range is a good general purpose range for indoor light levels.
- The 0–150,000 lux range is used mainly for measurements in sunlight.

## Do I Need to Calibrate the Light Sensor? No.

You should not have to perform a new calibration when using the Light Sensor in the classroom. We have set the sensor to match our stored calibration before shipping it. You can simply use the appropriate calibration file that is stored in your data-collection program from Vernier in any of these ways:

1. If you ordered the LS-BTA version of the sensor, and you are using it with a LabPro, Go!Link, SensorDAQ, or CBL 2 interface, then a calibration (in lux) is automatically loaded when the Light Sensor is connected.
2. If you are using Logger *Pro* software (version 2.0 or newer) on a computer, open an experiment file for the Light Sensor and its stored calibration will be loaded at the same time.
3. Any version of the DataMate program (with LabPro or CBL 2), EasyData, or DataPro has stored calibrations for this sensor.

In most cases, you can simply load an experiment file that is designed for use with the Light Sensor and calibration is taken care of. Different calibration files are provided for each of the three switch settings. Be sure to load the file that matches the switch setting you are using.

In other cases, you can use this sensor without calibration, reading just voltage. Note that for this sensor, voltage is always proportional to light intensity. If you want to calibrate the Light Sensor yourself, you can do so. Using a calibrated light meter and is similar to the procedure used to calibrate any other Vernier probe. Make sure the switch on the Light Sensor box is set to the correct range. If you want to calibrate more than one range, you will need to repeat the following procedure and treat each range as a separate probe.

## Calibration Using Another Light Meter

This calibration method is easy if you have a calibrated light meter. You simply do a standard two-point calibration as described in the data collection program manual using two different light levels, both measured with your calibrated, hand-held light meter. The input should be named “Illuminance” and the units should be “lux”. Save the experiment file on disk. Use a name for the calibration file that indicates the

setting of the range switch, such as: LS600 or LS6000. You will need to have the switch set to the correct range whenever you reload your experiment file.

## Warranty

Vernier warrants this product to be free from defects in materials and workmanship for a period of five years from the date of shipment to the customer. This warranty does not cover damage to the product caused by abuse or improper use.



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